

Note:

The attached technical assessment of A.C.E. Revision II includes findings and limitations of the associated methodology. This document begins with the summary provided for the March 12, 2003 meeting of the Committee on National Statistics. The full document is available on the Census Bureau's internet site at www.census.gov/dmd/www/refroom.html. Additional reports containing considerably more detail and analysis of the A.C.E. Revision II findings can be found at this same internet address.

Technical Summary of A.C.E. Revision II for The Committee on National Statistics

This report summarizes the findings and limitations of the Accuracy and Coverage Evaluation (A.C.E.) Revision II research and analysis as set forth in the detailed research reports. The Census Bureau conducted the original A.C.E. as part of Census 2000 with the expectation that it could be used to adjust the Census 2000 results for all non-apportionment purposes if it improved the census data. The A.C.E. used Dual-System Estimation (DSE) to estimate the net coverage of Census 2000. The A.C.E. results were produced in March 2001, but evaluations and analyses of the estimates conducted through October 2001 indicated problems that precluded their use for any official purposes. The estimates were publicly released, under court order, in December 2002. The goal of the A.C.E. Revision II work carried out over the last year has been to further examine these problems with the goal of producing improved estimates of the net coverage of Census 2000. If sufficient improvements could be made in the net coverage estimates, the A.C.E. Revision II estimates could then potentially be used to improve the intercensal population estimates, adjusting them for the net coverage errors of Census 2000.

This work has now been completed and the Census Bureau is ready to issue its results and to determine whether or not to adjust the intercensal population estimates using the results of A.C.E. Revision II. It should be noted that this report neither documents the decision, nor does it make any recommendations in this regard. Rather, this document is intended to document the results of the research.

Much of the research conducted for A.C.E. Revision II over the past year has been new and groundbreaking. While prior research and adjustment activities had focused on errors of omission, this research also accounts for errors of erroneous inclusion to improve estimates of net undercount. Based on the underlying premise of a very small net national undercount, this required a very careful accounting of both types of errors. Extensive research and analysis were conducted to reduce errors in the data and to develop new methodology so that corrections could be made to the DSE. New statistical matching and models for exact matching, which accounted for coincidental agreement, were developed to further enhance the detection of census duplicates. For the first time, extensive evaluation results were integrated into the DSE using double sampling ratio adjustments while accounting for overlap between evaluations. Additionally, new models were required to estimate probabilities of correct enumeration and probabilities of residency status on census day for those cases with a duplicate link. Some of the more important aspects of the work are discussed below.

A.C.E. Person Follow-up data were combined with evaluation follow-up data and a sample of the data was re-coded to produce improved estimates of census erroneous enumerations and census omissions. Further study of census duplication (a type of erroneous enumeration) resulted in improved identification of duplicates and potential non-residents included in the A.C.E. sample on Census Day. These results were integrated into DSEs by population subgroups called post-

strata. New E-Sample post-strata (distinct from the P-Sample post-strata) were developed to account for additional variation in erroneous enumeration rates. Finally, the estimates thus obtained were further adjusted for correlation bias estimated using comparisons to sex ratios obtained from Demographic Analysis results. These efforts have not only addressed major problems with the March 2001 A.C.E. estimates, but have also yielded valuable insights into challenges of census coverage and the difficulties associated with coverage measurement. This new knowledge will be extremely useful in planning and carrying out the 2010 Census and an associated program of coverage measurement.

The totality of the evaluation and revision work performed leads to the conclusion that the A.C.E. Revision II estimates of the net coverage of Census 2000 are dramatically superior to the March 2001 A.C.E. estimates, and also represent significant improvements to the revised preliminary A.C.E. estimates issued in October 2001 (which were also limited in detail). The A.C.E. Revision II methodology, however, has some important limitations that lead to sources of error in the estimates, which are discussed below under question 4. The findings and limitations of the A.C.E. Revision II estimates are discussed in the remainder of this summary in the context of the following five questions:

1. What do the A.C.E. Revision II estimates say about net coverage in Census 2000?
2. Did the A.C.E. Revision II estimates address major problems with the March 2001 estimates?
3. What do evaluations say about the quality of the A.C.E. Revision II estimates?
4. What are the main limitations of the A.C.E. Revision II estimation methodology?
5. What do the A.C.E. Revision II results tell us about Census 2010 planning?

The full report provides additional background, more information on the A.C.E. Revision II methodology, and further discussion of the findings and limitations.

1. What Do the A.C.E. Revision II Estimates Say About Net Coverage in Census 2000?

The A.C.E. Revision II estimates suggest that Census 2000 produced a net overcount of the population. This finding is in contrast to the measures of net coverage for previous censuses and indeed contrasts dramatically with the March 2001 A.C.E. estimates as well. The estimates also suggest that Census 2000 reduced dramatically the differential net coverage between race groups seen in previous censuses. This latter finding is very consistent with findings of Demographic Analysis and indeed with the March 2001 A.C.E. estimates.

Some specific findings from the A.C.E. Revision II estimates are as follows:

- A.C.E. Revision II estimated that Census 2000 resulted in a net overcount of the total household population of about one-half of one percent.
- A.C.E. Revision II estimated a net overcount of 1.13 percent for non-Hispanic Whites, but a net undercount of 1.84 percent for non-Hispanic Blacks. Both of these estimates were found to be significantly different from zero.

- Net coverage estimates for all other race/Hispanic origin domains were not statistically different from zero for the A.C.E. Revision II estimates.
- A.C.E. Revision II estimated a net overcount of 1.25 percent for owners and a net undercount of 1.14 percent for non-owners. Non-owners showed differential net coverage estimates for every race/Hispanic origin domain with the exception of American Indians on reservations and Native Hawaiians and Other Pacific Islanders. These two domains are relatively small and their estimates of net coverage have large sampling errors.
- There were also differences in estimated census net coverage across age/sex groups. Statistically significant net overcounts were estimated for children aged 10-17, and for adult females aged 18-29, 30-49, and 50 and over, as well as for males aged 50 and over. Statistically significant net undercounts were estimated for males aged 18-29, and 30-49. The net coverage estimate for children aged 0-9 was a net overcount but not significantly different from zero.

In general, the A.C.E. Revision II findings are dramatically different from the March 2001 A.C.E. results. A.C.E. Revision II found a one-half of one percent net *overcount* of the total household population, whereas the March 2001 A.C.E. estimated a 1.18 percent net *undercount*. This difference reflects the correction of major errors in the March 2001 A.C.E. estimates. This further supports the October 2001 ESCAP II recommendation that the March 2001 A.C.E. estimates not be used for any official purposes. The A.C.E. Revised Preliminary estimates released initially in October 2001 are much closer to the A.C.E. Revision II estimates than are the March 2001 A.C.E. estimates. The A.C.E. Revised Preliminary estimates showed only a 0.06 percent net *undercount* of the household population. These preliminary estimates only corrected for errors in estimating census erroneous enumerations, whereas the A.C.E. Revision II estimates refined these corrections and also corrected for errors in estimating census omissions. Tables 1 and 2 in the appendix show key comparisons between these three sets of coverage estimates. The coverage estimates for the 1990 Census are also included.

The coverage discussed above is net census coverage. It is this coverage that is directly measured by the dual-system estimates. The gross errors of Census 2000, as with all previous censuses, are much larger than the net coverage errors. The DSE methodology does not directly provide estimates of gross census errors unless further assumptions are made. However, underlying research and evaluations can be used to provide some insight about the level of gross census errors.

The A.C.E. Revision II further study of census duplication estimated 5.8 million census duplicates, a figure which should be considered a lower bound on the true number of duplicates. In addition, the census contained other erroneous enumerations not caused by duplication such as fictitious enumerations or non-residents of the United States. To the extent that the erroneous inclusions were in the same geographic area and had the same relevant characteristics as the omitted persons, they were accurate predictions of persons who should have been counted and

they improved census accuracy. On the other hand, to the extent that they resided in different areas or had different characteristics, they represented errors and they reduced census accuracy. The differential net coverage estimated by A.C.E. Revision II indicates that census erroneous enumerations did not exactly offset census omissions.

Also, the census counts included 1.2 million count imputation persons. The Census Bureau believes that this imputation improved the overall accuracy of the census. However, while some of these imputations would represent persons that should have been enumerated, others would represent gross errors, as when persons were imputed into truly vacant housing units or when no persons were imputed into truly occupied housing units.

2. Did the A.C.E. Revision II Estimates Address Major Problems with the March 2001 Estimates?

The major issues raised with the March 2001 estimates by the ESCAP and ESCAP II Committees have been for the most part addressed by the work leading up to the release of the A.C.E. Revision II estimates. Limitations of the A.C.E. Revision II methodology relevant to some of these issues are discussed later under questions 3 and 4.

- Underestimation of Erroneous Enumerations

In October 2001, the ESCAP II Committee concluded that the March 2001 A.C.E. estimates had overstated the net undercount by at least 3 million persons due to significant underestimation of erroneous enumerations, many of which were census duplicates. The A.C.E. Revision II estimates incorporate revised estimates of census erroneous enumerations that use results from a new study of census duplication as well as results from a re-coding of a sample of records using both A.C.E. and evaluation follow-up data. A.C.E. Revision II estimates 4.7 million (rather than the at least 3 million reported earlier) more erroneous enumerations than were estimated by the March 2001 estimates.

- Differences with Demographic Analysis

The ESCAP Committee was concerned that unexplained inconsistencies between the March 2001 A.C.E. estimates and estimates from Demographic Analysis raised the possibility of an as-yet undiscovered problem in the March 2001 A.C.E. methodology.

The Revision II estimates and the Demographic Analysis estimates are reasonably consistent at the national level, eliminating the previous concern. This consistency was enhanced by the application of correlation bias adjustment to the A.C.E. Revision II estimates for adult males, since these adjustments forced adult sex ratios of the A.C.E. Revision II estimates to agree exactly with sex ratios

obtained using Demographic Analysis results. Estimates for adult females, however, were reasonably consistent, even though their estimates were not adjusted for correlation bias.

The primary exception to the consistency of results occurs for children aged 0-9. While the A.C.E. Revision II estimates a small net overcount for children 0-9 (the estimate was not statistically significantly different from zero), Demographic Analysis estimated a net undercount of 2.56 percent. The Demographic Analysis estimate for this age group is more accurate than those for other age groups because the estimate for young children depends primarily on recent birth registration data which are believed to be highly accurate.

- Estimates of Omissions

The March 2001 A.C.E. estimates clearly overstated census omissions from the P-Sample. The re-coding operations conducted as part of the A.C.E. Revision II process identified P-Sample cases that were mis-coded in regard to whether or not they were Census Day residents. The Census Day residency status was questionable both for some of the P-Sample matches and for some of the P-Sample non-matches. In addition, computer matching algorithms identified P-sample cases, both matches and nonmatches, that linked to census enumerations outside the A.C.E. search area, raising questions about whether these cases were Census Day residents of their A.C.E. sample blocks. The A.C.E. Revision II estimates were adjusted accordingly using the re-coded data and the results from the computer matching algorithms, and are believed to be much more accurate.

- Total Error Model and Loss Function Analysis

The ESCAP II Committee noted that there was not sufficient time by October 2001 to develop a new total error model that accounted for all the errors discovered from evaluations of the March 2001 A.C.E. estimates. This situation has now changed. Since the A.C.E. Revision II estimates incorporate adjustments for errors based on evaluation results, most of these errors have been removed from the new estimates to the extent that we can assess them. This left less error to be accounted for in the error model used for the loss function analysis. Thus, the new error model accounted for some of the remaining errors. Other errors could not be accounted for due to lack of data, and were thus effectively assumed to be negligible. It is unknown whether or not significant errors in the A.C.E. Revision II estimates still exist, but if they do, they are not accounted for in the current model. While the revised model used in the loss function analysis (results of which are discussed below) favored the A.C.E. Revision II estimates over the Census 2000 numbers, these results should be interpreted in the context of the important limitations of the analysis. Both results and limitations are discussed below.

- Missing Data

The level of missing data from the re-coding operation was comparable to that in the March 2001 A.C.E. and the 1990 PES. The A.C.E. Revision II missing data models are thought to be of higher quality than those used for the March 2001 A.C.E. estimates because the imputation cells rely on more information and more detailed questionnaire responses. Initially there was considerable concern about conflicting cases since there was not an appropriate donor pool for them that could be used for imputation. These cases result from situations where two apparently good and equal caliber interviews were obtained, but gave contradictory information. Special procedures were developed as part of the A.C.E. Revision II process where expert analysts were able to reduce the number of conflicting cases to very low levels.

3. What Do Evaluations Say About the Quality of the A.C.E. Revision II Estimates?

Evaluations were performed on the A.C.E. Revision II estimates to estimate their bias (systematic error) and variance (random error). The evaluations of bias were relatively limited because data that previously were used to estimate biases in the March 2001 estimates were used in the production of the A.C.E. Revision II estimates to correct for the major biases. The limited data available for evaluation of bias does not itself reflect negatively on the A.C.E. Revision II estimates; in fact, it is because of the corrections for these major errors that we believe the A.C.E. Revision II estimates to be of much higher quality than the March 2001 A.C.E. estimates. Nevertheless, although the evaluations do account for the variance arising from the corrections for bias, the corrections for bias in the A.C.E. Revision II estimates may themselves be subject to bias, the magnitude of which has not been quantified. This is particularly true for the corrections for correlation bias and for P-Sample cases that matched census enumerations outside the A.C.E. search area.

Loss function analysis examined the comparative accuracy of the A.C.E. Revision II estimates and the census for population levels and population shares for groupings of geographic areas such as states, counties, and places. The loss function analysis indicated that A.C.E. Revision II was more accurate for both shares and levels for all groupings considered, with the exception that the census produced more accurate estimates of levels for places with population of at least 100,000. More research is needed to understand the reason for the one exceptional result. The validity of the loss function analysis depends on the quality of the estimates of components of error in the A.C.E. Revision II, and some of those components are not quantified. The resulting implications on the loss function analysis are discussed below.

The measure of accuracy used by the loss functions was weighted mean squared error, with weights set inversely proportional to the census counts. Mean squared error equals the sum of variance and squared bias, and the bias and variance estimates account for both sampling and nonsampling errors. Of course, the bias and variance estimates will themselves have errors. The

effect of omitting a variance component (if the corresponding error is uncorrelated with other random effects) would be to overstate the accuracy of the A.C.E. Revision II estimate and to understate the accuracy of the census, but we have not identified significant omitted variance components. In general, we cannot be certain whether omitted biases will tend to make any given loss function analysis overstate or understate the comparative accuracy of the A.C.E. Revision II estimates relative to the census. Whether omitted biases cause the loss function to favor the census or the A.C.E. Revision II depends on the signs of the correlations between the omitted biases and the expected undercount rate for the areas considered.

The loss function analysis accounted for some but not all error components that could be identified in the A.C.E. Revision II estimates. More specifically, the bias estimate included error components for inconsistency of post-stratification assignments based on census versus A.C.E. data, for error from estimating the numbers of outmovers by the numbers of inmovers, and most importantly, for error in the estimates of census duplicates (although evaluations indicate that this last error may have been mis-estimated.) The variance estimate included sampling error components from both phases of sampling in A.C.E. Revision II estimates, and also random nonsampling error components from choice of imputation models and for models used to account for P-Sample cases that matched census enumerations outside the search area.

On the other hand, the loss function analysis did not account for the following errors: synthetic estimation error; bias from response error and coding error in P-Sample residency status, match status, and mover status; bias from response error and coding error in E-Sample correct enumeration status; bias in correlation bias adjustments to the estimates due to error in the Demographic Analysis sex ratios and to the choice of model used to implement the adjustments; and bias due to the choice of model used to adjust the dual system estimator for E-Sample cases with duplicate links.

Though not included in the loss functions, the effects of synthetic error were investigated. One source of synthetic error involves correcting the individual post-stratum estimates for errors estimated at more aggregate levels (such as the corrections for correlation bias and coding errors). Two of the variance components noted above (those related to choice of imputation models and to accounting for P-Sample cases matching to census enumerations outside the search area) were included in the loss functions, but these components reflect the level of these errors, not the synthetic errors from such corrections. Errors from other such corrections, such as the adjustments for correlation bias, also were not reflected. Another source of synthetic error is variation in census coverage within post-strata (something not captured by synthetic application of post-stratum coverage correction factors for specific areas). Analyses based on artificial populations that simulated patterns of coverage variation within post-strata were done to assess whether omission of resulting synthetic biases from the loss function analysis tilted the comparisons in one direction or another. These analyses did not change the overall loss function findings, though we recognize that the analyses were not conclusive. It should be kept in mind that synthetic error is expected to be more important for smaller areas. Any limitations of the loss functions regarding synthetic error are expected to be more important when comparing small places or counties than for large places or counties.

Although the loss function analysis incorporated all the components of error for which estimates were available, other biases in the A.C.E. Revision II estimates were not included as described above. Although we cannot ascertain whether omitted biases cause the loss functions to favor the census or the A.C.E. Revision II, sensitivity analyses could partially address this issue by examining the effect on the loss functions of different amounts and distributions of unaccounted for error. Such sensitivity analyses could lead to assessment of the amounts and distributions of error needed to change the directions of the indications from the loss function analysis.

In summary, when viewing the results of the loss function analysis, one must keep the assumptions and limitations in mind, as well as realize that the effect of any omitted biases could be in either direction (increasing or decreasing the estimate of the relative accuracy of the census versus the A.C.E. Revision II estimates). While the loss function evaluations suggest the superiority of the A.C.E. Revision II estimates, concerns do remain about whether the bias estimates used in the loss function analysis are of sufficient quality to assure the correctness of the results.

4. What are the Main Limitations of the A.C.E. Revision II Estimation Methodology?

The A.C.E. Revision II estimation methodology has some limitations, and uncertainty remains about certain methodology decisions that had an appreciable impact on the results. Some of these uncertainties are reflected in the loss function analysis mentioned above, but others are not. The main limitations and associated uncertainties are:

- Post-stratification

New post-strata were created for the E-Sample to better explain variation in correct enumeration rates. These new post-strata were different from those used for the P-Sample to estimate census omission rates. In particular, census proxy status was used as an E-Sample post-stratification factor, as proxy status was determined to be negatively correlated with correct enumeration. Use of the new post-strata may have reduced synthetic error for small geographic areas, but it also resulted in some extreme coverage correction factors for some combined E- and P-Sample post-strata, especially those related to proxy status. We do not know that these extreme coverage correction factors are incorrect, as census coverage for small areas can also be highly variable. We do recognize, however, that separately stratifying the E- and P-Samples raises a technical issue that could lead to a systematic bias in the direction of overcount estimates for places with unusually large proportions of proxy respondents.

- Correlation Bias

Adjustments of the A.C.E. Revision II estimates for correlation bias removed a significant source of error, but with certain limitations: (1) The adjustments assumed estimates for adult females were unbiased, and compared sex ratios

obtained from A.C.E. Revision II with those obtained from Demographic Analysis results to estimate correlation bias adjustments for adult males. This approach would not provide a good approximation to patterns of correlation bias that involve substantial correlation bias for adult females. (2) No correlation bias adjustments were made for children. (3) Different correlation bias models could have been used that provided identical fits to the available data, but that produced different sub-national results. The model chosen assumed constant relative correlation bias within post-strata, and was the simplest possible and probably had the lowest variances (though we have not yet been able to compare variances). (4) The demographic detail of the adjustments was limited (by that of the Demographic Analysis data used) to Black versus non-Black race groups by age. While it is possible that correlation bias differs according to race/Hispanic origin beyond the Black versus non-Black distinction of DA, or according to other factors (e.g., renter versus owner), we had no data to detect such differentials in correlation bias by race/Hispanic origin within the non-Black group. (5) Data for non-Blacks aged 18-29 did not permit estimation of correlation bias for this group, suggesting possible problems with the underlying assumptions (e.g., possible bias in estimates for non-Black females aged 18-29), or with the Demographic Analysis or A.C.E. Revision II data for this group. In general, given limitations of data and assumptions, we could better estimate correlation bias for Blacks than for non-Blacks.

- P-Sample Links and Residency Status

The duplicate study identified P-Sample persons coded as non-mover residents who linked to a census enumeration outside the A.C.E. search area. The study could not, however, determine which location was the correct Census Day residence. This was addressed by assigning to the P-Sample record a probability that its location was the person's Census Day residence. Only limited data were available from which to develop these probabilities, so they were developed from correct enumeration probabilities developed for the E-Sample cases with duplicate links for comparable situations. Other reasonable alternatives for assigning residency status probabilities are reflected in the loss function analysis.

- Underestimation of Duplicates

The identification of census duplicates was conservative in the sense that it probably resulted in underestimation of the number of duplicates. This leads to some error in the A.C.E. Revision II estimates. We considered, but rejected, applying an efficiency adjustment to account for missed duplicates. Analysis of the duplicates within the A.C.E. clusters and the characteristics of those duplicates were studied. This study showed that for those groups where it appeared that a large percentage of duplicates were missed within the cluster, the mechanism causing those duplicates, such as misdelivery of census mail forms, was likely not to be that causing duplication to occur outside the cluster.

- Estimating Correct Enumerations Among Duplicates

The person duplication study identified E-Sample cases with a link to a census enumeration outside the A.C.E. search areas. In most cases, we did not feel we could determine which census record of a duplicate pair was correct. Assuming that such duplicate records are the same person and that one of the two census records is a correct enumeration, it is reasonable to expect that half of these E-Sample links are correct enumerations and half are erroneous. There were some exceptions where we felt we could determine which member of a duplicate pair was correct, such as links to census group quarters residents (such as college dorm residents). Taking the exceptions into account, probabilities of correct enumeration were assigned to maintain the expected overall proportion of correct enumerations among the duplicate links. For national totals, it does not matter which member of a duplicate pair is the correct enumeration, but this does affect post-stratum estimates, and hence subnational estimates.

5. What Do the A.C.E. Revision II Results Tell Us About Planning for the 2010 Census?

The A.C.E. Revision II estimates will be invaluable tools for planning the 2010 Census, focusing and supporting 2010 Census research and design. The Census 2000 Testing, Experimentation, and Evaluation Program is currently engaged in assessing Census 2000 operations and results, measuring the effectiveness and impact on data quality of the Census 2000 design, operations, systems, and processes. The A.C.E. Revision II work will feed into 2010 plans for this program and further their goals. The A.C.E. Revision II work will inform the 2010 Census research, development and testing program and provide information for the Master Address File and other Census Bureau surveys.

While many elements of the A.C.E. Revision II work will feed into the 2010 Census planning process, several areas of additional research and possible testing are immediately suggested:

First, Planning for the 2010 Census will clearly be informed by the A.C.E. Revision II work on census erroneous enumerations, particularly duplicates. The extent of undetected duplication in prior censuses is unclear, as previous censuses did not capture name information to allow duplicate detection by name (and birth date) matching. Much of the research in this area conducted by Census Bureau analysts over the past year has been new and groundbreaking. Clearly efforts should be made in the direction of preventing duplicates from occurring, as well as investigating ways to determine which member of a duplicate pair is correct.

Second, the A.C.E. Revision II work further highlights the need for research into the Census Bureau's residence rules. Decennial censuses use the concept of usual residence to determine where to count each individual, the goal being to count everyone once, only

once, and in the correct location. The residence rules proved problematic for several groups in Census 2000, and may have introduced error. Notable difficult situations involve college students, children in joint custody, and individuals with more than one residence. Cognitive research and testing of simplified, more understandable residence rules will be part of the 2010 Census research, development and testing program.

Third, the A.C.E. Revision II work confirms that proxy data is highly error-prone. Significant research and testing will be devoted to minimizing error in the 2010 Census caused by proxy data. Clearly census operations should be designed to limit the introduction of proxy data in the first place, and systems should be developed to improve the quality of the proxy data, when proxy data must be used.

The A.C.E. Revision II work will help build the foundation for making early and informed decisions about the role and scope of the 2010 Census in the federal statistical system and its interaction with the Master Address File. This work provides critical analysis and information for Census Bureau planning and implementation of decisions for the 2010 Census.

Appendix

Table 1: Percent Net Undercount for Major Groups

Characteristic	A.C.E. Revision II		A.C.E. Revised Preliminary		A.C.E. March 2001		1990 PES	
	Est. (%)	S.E. (%)	Est. (%)	S.E. (%)	Est. (%)	S.E. (%)	Est. (%)	S.E. (%)
Total	-0.49	0.20	0.06	0.18	1.18	0.13	1.61	0.20
Race/Hispanic Origin Domain								
Non-Hispanic White*	-1.13	0.20	-0.33	0.21	0.67	0.14	0.68	0.22
Non-Hispanic Black	1.84	0.43	0.78	0.45	2.17	0.35	4.57	0.55
Hispanic	0.71	0.44	1.25	0.54	2.85	0.38	4.99	0.82
Non-Hispanic Asian**	-0.75	0.68	-0.31	0.91	0.96	0.64	2.36	1.39
Hawaiian or Pacific Isl**	2.12	2.73	4.64	2.79	4.60	2.77	2.36	1.39
AI on Reservation***	-0.88	1.53	3.44	1.60	4.74	1.20	12.22	5.29
AI off Reservation***	0.62	1.35	3.44	1.60	3.28	1.33	0.68	0.22
Tenure								
Owner	-1.25	0.20	n/a	n/a	0.44	0.14	0.04	0.21
Non-Owner	1.14	0.36	n/a	n/a	2.75	0.26	4.51	0.43
Age/Sex								
0 - 9****	-0.46	0.33	n/a	n/a	1.54	0.19	3.18	0.29
10 - 17****	-1.32	0.41	n/a	n/a	1.54	0.19	3.18	0.29
18 - 29 Male	1.12	0.63	n/a	n/a	3.77	0.32	3.30	0.54
18 - 29 Female	-1.39	0.52	n/a	n/a	2.23	0.29	2.83	0.47
30 - 49 Male	2.01	0.25	n/a	n/a	1.86	0.19	1.89	0.32
30 - 49 Female	-0.60	0.25	n/a	n/a	0.96	0.17	0.88	0.25
50+ Male	-0.80	0.27	n/a	n/a	-0.25	0.18	-0.59	0.34
50+ Female	-2.53	0.27	n/a	n/a	-0.79	0.17	-1.24	0.29

The A.C.E. Revision II, the A.C.E. Revised Preliminary, and the A.C.E. March 2001 net undercount are for the household population. The 1990 net undercount is for the PES universe which included noninstitutional, nonmilitary group quarters in addition to the household population. The results from the Committee on Adjustment of Post-censal Estimates (CAPE) are total population estimates. As a result, the 1990 estimates may differ from the CAPE results. See Bryant et al. (1992) and Thompson (1992).

*For 1990, AI off Reservation was included in the Non-Hispanic White Race/Hispanic Origin Domain. Therefore, the net undercount and standard error for these domains are identical.

**For 1990, Asian or Pacific Isl. was a single Race/Hispanic Origin Domain. Therefore, for Non-Hispanic Asian and for Hawaiian or Pacific Isl, the net undercount and standard error are repeated.

***For the A.C.E. Revised Preliminary estimates, American Indian and Alaskan Native was a single Race/Hispanic Origin Domain. Therefore, for AI on Reservation and for AI off Reservation, the net undercount and standard error are identical.

****For March 2001 and for the 1990 PES, the "0 - 17" Age/Sex group was a single group. Therefore, the net undercount and standard error for children "0 - 9" and "10 - 17" are identical.

A negative net undercount denotes a net overcount.

"n/a" means "Not Available."

Appendix

Table 2: Net Undercount Estimates for Major Groups (in thousands)

Characteristic	Census 2000	A.C.E. Revision II		A.C.E. March 2001		1990 PES	
		Est.	S.E.	Est.	S.E.	Est.	S.E.
Total	273,587	-1,332	542	3,262	378	3,994	488
Race/Hispanic Origin Domain							
Non-Hispanic White*	192,924	-2,151	382	1,302	272	1,277	417
Non-Hispanic Black	33,470	628	146	741	121	1,389	168
Hispanic	34,538	248	152	1,014	141	1,102	181
Non-Hispanic Asian**	9,960	-74	67	96	65	174	103
Hawaiian or Pacific Isl**	590	13	16	28	18		
AI on Reservation	540	-5	8	27	7	52	22
AI off Reservation*	1,565	10	21	53	22		
Tenure							
Owner	187,925	-2,320	372	840	264	71	334
Non-Owner	85,662	988	310	2,422	235	3,871	368
Age/Sex							
0 - 9***	39,642	-180	130	1,127	141	2,084	191
10 - 17***	32,307	-422	129				
18 - 29 Male	21,594	245	138	845	76	792	130
18 - 29 Female	21,576	-295	111	492	65	687	113
30 - 49 Male	41,297	848	104	784	83	685	114
30 - 49 Female	42,783	-257	105	414	73	326	95
50+ Male	33,798	-270	90	-83	61	-160	93
50+ Female	40,590	-1,001	107	-318	67	-419	98

The Census count is for the household population.

The A.C.E. Revision II and the A.C.E. March 2001 net undercount are for the household population.

The 1990 net undercount is for the PES universe which included noninstitutional, nonmilitary group quarters in addition to the household population. The results from the Committee on Adjustment of Post-censal Estimates (CAPE) are total population estimates. As a result, the 1990 estimates may differ from the CAPE results. See Bryant et al. (1992) and Thompson (1992).

*For 1990, AI off Reservation was included in the Non-Hispanic White Race/Hispanic Origin Domain.

**For 1990, Asian or Pacific Isl. was a single Race/Hispanic Origin Domain. Therefore, the net undercount and standard error displayed is for the Asian or Pacific Isl Domain.

***For March 2001 and for the 1990 PES, the "0 - 17" Age/Sex group was a single group. Therefore, the net undercount and standard error displayed are for the "0 - 17" Age/Sex group.

Estimates from the A.C.E. Revised Preliminary methodology are not available. Since the revised preliminary estimates are only an approximation of the undercount, the dual system estimates were not calculated.

A negative net undercount denotes a net overcount.